Small Business Innovation Research/Small Business Tech Transfer

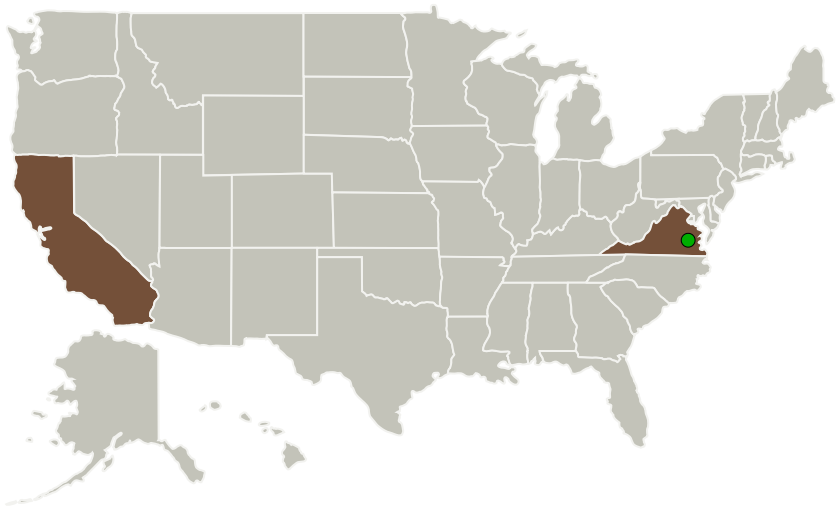
Physics-Based Conceptual Design Flying Qualities Analysis using OpenVSP and VSPAero, Phase I

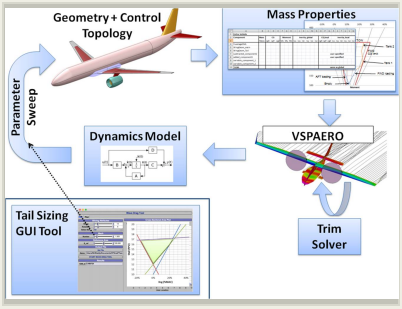
Completed Technology Project (2016 - 2016)

Project Introduction

NASA?s OpenVSP tool suite provides a common parametrically driven geometry model formany different analyses for aircraft and is primarily used in the conceptual design phase. The current 3.5.1 release currently contains significant gaps when assessing handling qualities for a particular configuration forcing the engineer to rely on historical methods with limited applicability to advanced technology design concepts with unconventional configurations. In the proposed effort, ESAero will develop an integrated workflow within the OpenVSP suite for quantitative assessment of handling qualities enabling the engineer to explore new design spaces with unconventional configurations. Along with this workflow a set of pre-requisite tasks to improve the system modeling capabilities will be completed as well. These efforts include: improving flight control surface modeling, improved mass properties representation for generic components, a new aerodynamic trim solver, a new vehicle dynamics model calculation, and a new parameter sweep capability to tie geometry to quantitative physics base handling qualities. These efforts will also lay the ground work for follow on studies of high lift aerodynamics and closed loop flight control. The proposed efforts are designed to complement the existing and active OpenVSP and VSPAERO development efforts.

Primary U.S. Work Locations and Key Partners





Physics-Based Conceptual Design Flying Qualities Analysis using OpenVSP and VSPAero, Phase I

Table of Contents

Physics-Based Conceptual Design Flying Qualities Analysis using OpenVSP and VSPAero, Phase I

Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
Empirical Systems Aerospace, Inc.(ESAero)	Lead Organization	Industry	Pismo Beach, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

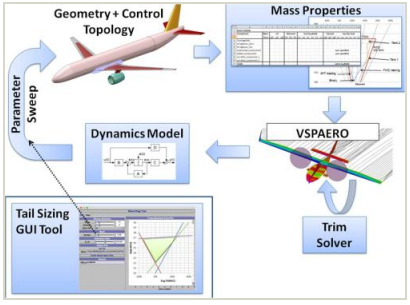
June 2016: Project Start

December 2016: Closed out

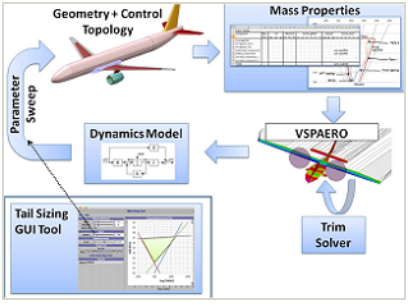
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139708)*

Images



Briefing Chart Image
Physics-Based Conceptual Design Flying Qualities Analysis using OpenVSP and VSPAero, Phase I *(https://techport.nasa.gov/image/128251)*



Final Summary Chart Image
Physics-Based Conceptual Design Flying Qualities Analysis using OpenVSP and VSPAero, Phase I Project Image *(https://techport.nasa.gov/image/136956)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Empirical Systems Aerospace, Inc. (ESAero)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

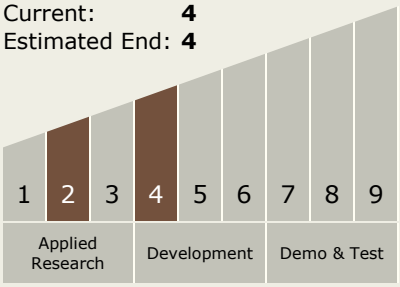
Carlos Torrez

Principal Investigator:

Nicholas Brake

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Physics-Based Conceptual Design Flying Qualities Analysis using OpenVSP and VSPAero, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.5 GN&C Systems Engineering Technologies
    - TX17.5.8 Flying/Handling Qualities

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System